

## Corporate Diversification, Information Asymmetry and Insider Trading

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Note BJM guidelines: *‘The maximum word length for a typical manuscript is 6,000 words. **This excludes references, figures and tables.** However, we recognise that there may be cases where there is a strong argument for a higher word count, for example in papers where the analysis is narrative focused. In these exceptional cases authors must state in their covering letter precisely why the word count needs to be exceeded. Papers of more than 8,000 words will not be considered and will automatically be sent back to the author. Similarly revised papers of more than 8,000 words will not be considered.’*

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### Abstract

The empirical literature suggests that diversified firms are usually sold at a discount relative to single-segment firms. This ‘diversification discount’ is usually considered as a symptom of managers pursuing diversification strategies to benefit themselves rather than to increase firm value. ~~We provide evidence that suggests that managers themselves disagree with outsiders valuation and consider diversification strategies to be value increasing. Specifically, However, we found~~we document that corporate

insiders purchase more of their firms' shares in the open market when industrial diversification is high and when outsiders consider diversification to be more value-destructive (i.e. when diversification discount is high). Thus, corporate insiders, whose human capital is already tied to the prospects of their firms, consider their diversification strategies to be valuable enough to justify more investment in their firms. Outside investors, however, may misvalue diversification strategies if corporate diversification creates higher information asymmetries between insiders and outsiders. We provide ~~some~~ evidence for a positive relationship between ~~the~~ corporate diversification and information asymmetries. ~~Specifically, we report that the market reaction to insider trading is increasing in the extent of corporate diversification.~~

**Keywords:** *Corporate diversification, insider trading, diversification discount, information asymmetry, agency theory.*

**JEL classification:** *G14, G32*

## 1 – Introduction

A persistent concern within the finance and management literature is the impact of corporate diversification on the firm value<sup>1</sup>, the agency effect. ~~From the dominant agency theory perspective, managers implement diversification strategies to benefit themselves at the expense of their shareholders (e.g. (Amihud and Lev, 1981; Denis, Denis and Sarin, 1999; Aggarwal and Samwick, 2003). We call this the 'agency effect'~~

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<sup>1</sup> See Montgomery (1994), Martin and Sayrak (2003) and Hitt et al. (2006) for reviews.

~~of corporate diversification. This agency effect is widely invoked by researchers who argue that diversified firms are usually sold at a discount when compared to single-segment (focused) firms (see Lins and Servaes, 1999; Denis et al., 2002; Jiraporn et al., 2007).~~

An alternative view is that diversification may be in the interests of both ~~there may not necessarily be a conflict of interests between~~ managers and shareholders ~~when it comes to strategic decisions such as those related to corporate diversification~~ (see Fox and Hamilton, 1994; Lane et al., 1998; Davis et al., 1997; Postrel and Rumelt, 2005). However, in the presence of information asymmetries ‘principals may not be able to distinguish between agent cooperation and defection’ (Gomez-Meija and Wiseman 2007: 82). ~~Thus, even if managers diversify with the view to increase the value of their firms, outside investors may undervalue diversification if it results in higher information asymmetries between managers and outsiders. We call this,~~ the ‘information effect’ of diversification.

~~The extant empirical literature is silent on whether it is the agency effect or the information effect that dominates. This is unfortunate because these two effects have radically different implications for the management literature and for corporate policy. For example, if the agency effect dominates, then the emphasis is likely to be on creating corporate governance mechanisms that ensure that managers avoid diversification and focus on their firms’ core competencies (see Denis et al., 2002; Jiraporn et al., 2007). However, if the information effect dominates, then diversification is unlikely to be considered as a “‘value destructive”’ strategy. Consequently, the~~

~~emphasis is likely to be on mechanisms that enable managers to materialise potential operating and financial synergies associated with diversification, and to signal value relevance of these strategies to their shareholders (see Lane et al., 1998, 1999). We We contribute to literature by providing~~provide evidence that enables us to distinguish between the agency effect and the information effect of corporate diversification.

Our analysis is based upon the established insider trading literature<sup>2</sup> that suggests that corporate insiders trade shares of their firms on the basis of their informational advantage over outsiders about the prospects of their firms (e.g. Fishman and Hagerty, 1992), and that outside investors consider these trades as credible signals about the value of firms (e.g. Damodaran and Liu, 1993; Manne, 2005). ~~We utilise this literature to contribute to the debate on the agency effect and the information effect of corporate diversification in four important ways.~~

First~~ly~~, we propose and test hypotheses that link the intensity of insider purchases to corporate diversification and diversification discount. ~~We argue that if insiders pursue diversification strategies to extract private benefits and not to increase their firms' value (the agency effect), then they have little incentive to buy shares of their firms in the open market given that they can buy shares of other firms to create a diversified portfolio. However, if they really consider corporate diversification to be value enhancing, they would buy their own firms' shares more actively, especially when they believe that outsiders incorrectly undervalue their diversification strategies due to~~

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<sup>2</sup> See Bainbridge (2001) for a review. Following the large body of literature on the subject, insider trading in this paper refers to trades by executive and non-executive directors, which is compatible with the UK regulation that defines insiders as executives and non-executives directors (e.g. Fidrmuc et al., 2006). In the remaining text, we will use the terms directors and insiders interchangeably.

~~information asymmetries (the information effect). We find that the intensity of insider purchases is increasing in the extent of industrial diversification and in the level of diversification discount. This evidence is consistent with the information effect.~~

Second~~ly~~, we provide further evidence on the link between corporate diversification and the information asymmetries between corporate insiders and outside investors by examining the market reaction to insider trading. Unlike earlier papers that rely on bid-ask spread (e.g. Clarke et al., 2004), analysts' forecasts errors (e.g. Thomas, 2002; Duru and Reeb, 2002) and market reaction to equity offerings (e.g. Hadlock et al., 2001), we provide more direct evidence on insiders' informational advantage over outsiders by examining how outside investors react when insiders trade shares of their firms in the open market. We argue that if corporate diversification increases insiders' informational advantage over outsiders, the market reaction to insider trading will be increasing in the extent of corporate diversification. Our results support this argument.

Third~~ly~~, we examine the impact of both industrial and geographic diversification on the level of information asymmetries between insiders and outside investors. To the best of our knowledge, the existing empirical studies in this area concentrate either on industrial diversification (e.g. Hadlock et al., 2001; Thomas, 2002) or on geographic diversification (Duru and Reeb, 2002). ~~We examine both types of diversification and find some evidence that suggests that industrial and geographic diversification differ in terms of their relationship with the level of information asymmetries between insiders and outsiders.~~

~~Finally, to the best of our knowledge, this is the first study to look at the information asymmetries due to corporate diversification using non-US data. The rest of the paper is structured as follows. The next section provides a brief review of related literature and outlines our hypotheses. Section 3 describes our methods and data. Section 4 presents our empirical results. Section 5 summarises and concludes.~~

## **2 –Related literature and hypotheses development**

### **2.1 – Corporate diversification, agency relationship and information asymmetries**

The literature suggests that by diversifying into new lines of businesses, firms could benefit from economies of scope (Teece, 1982), increased market power and competitive advantage (Markides and Williamson, 1994), higher debt capacity (e.g. Llewellyn, 1971), and/or more active internal capital markets (e.g. Stein, 1997; Rajan et al., 2004). Geographic diversification, in addition, could enable firms to “accentuate their existing core competencies, gain unique knowledge, and access substantial growth opportunities in the product markets of foreign countries (Hitt et al., 2006: 834)”.

Despite the above potential benefits of corporate diversification, recent empirical literature suggests that diversification destroys shareholder wealth (e.g. Berger and Ofek, 1995; Lins and Servaes, 1999; Palich et al., 2000; Barnes and Hardie-Brown, 2006)<sup>3</sup>. The value destruction due to diversification is usually explained from the agency theory perspective in which managers diversify in order to obtain private benefits rather than to increase the value of their firms (see, e.g., Denis et al., 2002;

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<sup>3</sup> However, some studies do find that diversification results in a premium rather than a discount. For example, Villalonga (2004) uses establishment level data and documents significant diversification premium. Barnes and Hardie-Brown (2006) and Qian et al. (2008) suggest that, within some sectors, geographical diversification may significantly increase firm value.

Aggarwal and Samwick, 2003; Jiraporn et al., 2007). ~~An early work in this area is that of Amihud and Lev (1981: 606), who argue that managers diversify in order to reduce 'risk associated with managerial human capital'.~~ Moreover, managers may utilise internal capital markets in multi-segment firms to sustain their empires by transferring free cash-flow from cash-rich segments to other segments that lack good investment opportunities (e.g. Jensen, 1986; Rajan et al., 2002).

However, it is also argued that, within the context of important strategic decisions such as those related to corporate diversification, managerial choices may be moulded by ~~social ties and settings, and, indeed~~ professionalism or altruism (see, for example, Davis et al., 1997; Postrel and Rumelt, 2005; Gomez-Meija and Wiseman, 2007). In other words~~From this perspective~~, corporate diversification strategies are implemented by managers with a view to enhance the value of their firms (see Lane et al., 1998; Davis et al., 1997). But then, how can this alternative perspective explain the existence of diversification discount?

One possible explanation is the 'transparency' approach, ~~is based on the argument~~ that corporate diversification increases information asymmetries between insiders and outside investors (e.g. Hadlock et al. 2001; (Nanda and Narayanan, 1999; Krishnaswami and Subramaniam, 1999; Aoki, 2010). ~~Hadlock et al. (2001) call this 'the transparency hypothesis'. Here, it is argued that a~~ An increase in corporate diversification makes firms more complex and opaque, and the consolidated information available to outsiders is insufficient to assess the true value of these firms. ~~Consequently, even if managers implement diversification strategies to utilise p~~Hence~~potential benefits associated with~~

~~these strategies~~, increased information asymmetries could lead to a misvaluation by outside investors. Krishnaswami and Subramaniam (1999) provide some empirical support for this transparency effect by documenting a decrease in information asymmetries, as measured by analysts' forecast errors, after corporate spin-offs ~~that reduce the level of corporate diversification~~ (c.f. ~~see also~~, Duru and Reeb, 2002; Bergh et al., 2008).

However, some studies ~~also~~ ~~posit~~ a negative relationship between the level of information asymmetries and corporate diversification (~~see~~ Hadlock et al, 2001). The 'information diversification' ~~approach hypothesis~~ suggests that if outsiders' valuation errors about individual segments of diversified firms are not perfectly positively correlated, then the average valuation errors for diversified firms are smaller than those for focused firms. ~~Consequently, information asymmetries are expected to be lower for diversified firm (see Hadlock et al., 2001).~~ Thomas (2002) provides supporting evidence for this hypothesis by documenting a negative relationship between diversification and analysts' forecasts errors (see also Clarke et al., 2004).

## 2.2 – Corporate diversification, insiders' beliefs and the intensity of insider trading

Why do corporate insiders trade shares of their firms in the open market?<sup>4</sup> The insider trading literature suggests that corporate insiders trade shares of their firms because they can benefit from their superior information about the prospects of their firms and/or they believe that outsiders misvalue their firms on the basis of the available information (Seyhun, 1986; Piotroski and Roulstone, 2005). For example, Rozeff and Zaman (1998)

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<sup>4</sup> See Bainbridge (2001) for a review.



document that insiders take advantage of market overreaction by selling overvalued ‘growth stock’ and buying undervalued ‘value stocks’. By willingly purchasing shares of their firms in the open market, corporate insiders can send credible signals to outsiders about the value of strategies that they implement (see Damodaran and Liu, 1993; Manne, 2005). Piotroski and Roulstone (2005) note that the intensity of insider purchases is significantly positively related to firms’ future performance (e.g. one year ahead market-adjusted returns), and negatively related to current performance (e.g. contemporaneous market-adjusted returns).

We build upon this literature and propose hypotheses relating the intensity of insider purchases to the extent of corporate diversification and to diversification discount. Given that insiders’ human capital is already tied to their firms (e.g. Amihud and Lev, 1981), purchasing shares of their own firms is costly because it increases the amount of firm-specific risk that corporate insiders are exposed to (see Demsetz, 1986). ~~However, corporate insiders can benefit by trading on the basis of their informational advantage over outside investors (see Fishman and Hagerty, 1992). In addition, by willingly purchasing shares of their firms in the open market, corporate insiders can send credible signals to outsiders about the value of strategies that they implement (see Damodaran and Liu, 1993; Manne, 2005).~~ However, if insiders believe that their strategies are value-enhancing, and that outsiders misvalue their firms due to information asymmetries, then they have more incentives to actively purchase shares of their firms in the open market. ~~Within the context of this paper~~ Hence, insiders’ incentive to buy shares of their firms ~~may is likely to~~ be contingent upon their knowledge and beliefs about the value relevance of corporate diversification.

### ***Insider trading and the agency effect of corporate diversification***

From the agency theory perspective on corporate diversification, insiders' incentive to purchase shares of their firms is likely to be particularly low because they know that they have implemented diversification strategies with the intention to benefit themselves rather than to increase the value of their firms<sup>5</sup>. Furthermore, when diversified firms are sold at a discount, insiders, who have superior knowledge about the value-decreasing diversification strategies, do not expect the diversification discount to disappear with the passage of time. Overall, assuming that insiders consider corporate diversification as a means to benefit themselves and not to increase firm value (i.e. when the agency effect dominates), we hypothesise that:

**Hypothesis 1a:** *The intensity of insider purchases is negatively related to the extent of corporate diversification.*

**Hypothesis 2a:** *The intensity of insider purchases is negatively related to the level of diversification discount.*

### ***Insider trading and the information effect of corporate diversification***

The above hypotheses are based on the agency effect of corporate diversification.

However, as noted above, it could be argued that managers implement diversification

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<sup>5</sup> It could be argued that diversification brings with it opportunities to further increase managerial perquisites, such as rewards packages, travel, office allowances, etc., the costs of which are borne by all shareholders (McConnell et al., 2010: 306). Consequently managers may have an incentive to hold significant numbers of shares in their own right to defend hostile takeover bids that are likely to imperil their perquisites (Morck et al., 1988). However, there is evidence that hostile takeovers are not primarily prompted by sub-optimal performance (Franks and Mayer, 1996), and are likely to be deterred by the size and diversification of the target company (Comment and Schwert, 2010). Hence, managers may use growth and diversification as a means of warding off hostile takeovers, without having to rely on the defence of personal shareholding (c.f. Morck et al., 1988).

strategies to increase firm value but, due to increased information asymmetries, outsiders are not able to assess the correct value of these strategies (i.e. the information effect). Here, insiders are likely to purchase shares of their own firms when they truly believe in the potential benefits of their diversification strategies, ~~and~~ when they expect the true value of diversification strategies to be revealed with the resolution of uncertainty surrounding these strategies over time and/or to signal their beliefs about the value of diversification. ~~Moreover, corporate insiders may like to signal their beliefs about the value of diversification, especially when they perceive that outside investors undervalue the potential benefits of diversification strategies.~~ They could do so by increasing the amount of disclosure about the operations and the linkages between different segments (see Hope et al., 2009), but this may. ~~However, more disclosure may~~ lead to a gradual deterioration in the competitive advantages brought about by corporate diversification (Edwards and Smith, 1996). ~~An alternative and more credible signalling mechanism for corporate insiders to convey the information about the potential benefits of diversification strategies could be to purchase shares of their own firm in the open market that increases their exposure to firm specific risk and to the outcomes of diversification strategies. Overall, assuming~~ Hence, assuming that the information effect of corporate diversification dominates, we propose the following two hypotheses:

**Hypothesis 1b:** *The intensity of insider purchases is positively related to the extent of corporate diversification.*

**Hypothesis 2b:** *The intensity of insider purchases is positively related to the level of diversification discount.*

Here, hypothesis 1b is a competing hypothesis for hypothesis 1a, while hypothesis 2b is a competing hypothesis for 2a. It is important to note here that hypotheses 1a and 1b specify a link between the extent of corporate diversification and corporate insiders' beliefs measured by the intensity of insider purchases without taking into account outsiders' assessment of the diversification strategies in place. Hypotheses 2a and 2b, however, consider the link between that the intensity of insider purchases and potential (mis)valuation of diversification strategies by outside investors.

### 2.3 – Corporate diversification and information conveyed by insider trading

A substantial portion of the insider trading literature examines the consequences of information conveyed ~~throughby~~ insider trading, finding that insider purchases result in a significant and positive stock price reaction, while insider sales lead to a negative reaction (e.g. c.f. Seyhun, 1986; Lakonishok and Lee, 2001; Fidrmuc et al., 2006). This evidence is substantial and quite consistent. In essence, the evidence suggests that ~~insider purchases result in a significant and positive stock price reaction, while insider sales lead to a negative reaction (albeit not always a statistically significant one)~~. This positive (negative) market reaction to purchases (sales) reflects the effect of corporate insiders' favourable (unfavourable) value-relevant information being incorporated in the stock price<sup>6</sup>.

Recent studies find that the magnitude of the stock market reaction to insider trading is contingent upon firm-specific characteristics that determine the level of information

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<sup>6</sup> Further evidence on the information effect comes from insider trading around corporate events. For example, Hirschey and Zaima (1989) find that shareholders' returns due to corporate asset sell-offs is related to the signals provided by the intensity of insider trading. Specifically, they find that stock price reaction to asset sell-offs is significantly positive when insiders are net purchasers prior to these deals.

asymmetries between corporate insiders and outside investors; the market reaction to insiders' trades is likely to be higher for firms that are in possession of assets or strategies that are harder for outsiders to value (see, e.g. Coff and Lee, 2003). For example, smaller firms are found to have larger market reaction to insider trading (see, e.g. Seyhun, 1986; Jeng et al., 2001). This is attributed to insiders of smaller firms possessing a 'significant portion of relevant information', which is conveyed to the market through their trades (see Jeng et al., 2001: 464). Similarly, it is argued that, compared to insiders, outsiders are at a disadvantage in assessing the value of research and development (R&D) projects because these projects are “complex and tacit” (see Coff and Lee, 2003: 184; Aboody and Lev, 2001). ~~Consequently, Coff and Lee (2003) suggest that the positive (negative) market reaction to insiders' purchases (sales) is more positive (negative) for firms with R&D projects.~~

~~Following the above literature~~Hence, we posit that the market reaction to insider trading is contingent upon the extent of corporate diversification. ~~Our point of departure is the argument that~~ outsiders react to insider trading because they consider these trades to carry value-relevant information. Consequently, the extent of corporate diversification is likely to affect the market reaction to insider trading if it ~~impacts on~~affects the level of information asymmetries ~~between corporate insider and outside investors~~. As we noted in section 2.1, corporate diversification could have two opposite effects on information asymmetries between insiders and outsiders. The transparency approach ~~suggests~~hypothesis predicts that corporate diversification exacerbates information asymmetries between insiders and outsiders, whilst ~~t~~. ~~In contrast,~~ the information diversification approach ~~holds~~hypothesis suggests that information asymmetries are

lower for diversified firms ~~if outsiders' valuation errors associated with individual segments of diversified firms are not perfectly positively correlated (c.f. see Hadlock et al., 2001; Thomas, 2002). From this perspective, corporate insiders' informational advantage over outsiders is diversified away when their firms operate in multiple lines of businesses (see Huson and Mackinnon, 2003). Overall, whether corporate diversification increases or decreases insiders' informational advantage over outsiders depends on which effect (transparency effect or information diversification effect) dominates. If the transparency approach is correct corporate diversification increases insiders' informational advantage over outsiders by making firms less transparent to outsiders,~~ then we expect that:

**Hypothesis 3a:** *The information conveyed by insider trading is positively related to the extent of corporate diversification.*

However, if ~~the information diversification approach is correct corporate diversification moderates insiders' informational advantage over outsiders, the,~~ then we expect that:

**Hypothesis 3b:** *The information conveyed by insider trading is negatively related to the extent of corporate diversification.*

## 2.4 – Distinction between industrial and geographic diversification

In the above sub-sections, we do not make any distinction between industrial and geographic diversification. However, it is essential to distinguish between industrial and geographic diversification if these two types of diversification differ in terms of

informational advantage that they provide to corporate insiders. To the best of our knowledge, this is an unexplored area. We conjecture that the level of information asymmetries between insiders and outsiders is likely to be smaller for geographical diversification than for industrial diversification. We provide two possible explanations this.

First, ~~while both types of diversification make firms less transparent to outsiders, the~~ information diversification effect ~~may is likely to~~ be stronger for geographically diversified firms. The explanation for this is as follows. Similar to industrially diversified firms, the valuation of geographically diversified firms depends on the prospects of different segments. ~~The information diversification hypothesis posits that outsiders make valuation errors, which are less than perfectly positively correlated. Thus, the overall valuation errors are smaller for diversified firms.~~ The information diversification effect may be ~~is~~ present for both industrially and geographically diversified firms. However, unlike firms that operate only in one country, the prospects of geographically diversified firms depend on economy-wide fluctuations ~~in~~ of different countries. Thus, for geographically diversified, outsiders are likely to make errors not only about different lines of businesses but also about fluctuations in different economies. ~~If these economies and outsiders errors about these economies are less than perfectly positively correlated, then o~~ Q ~~utside~~ rs' average valuation errors are likely to be smaller for geographically diversified compared to those for firms that operate only in one country.

Second, when firms diversify industrially, they move into new lines of business. ~~There are uncertainties associated with diversification.~~ Both insiders and outsiders form expectations about the value of industrial diversification strategies. However, insiders, who obtain and evaluate information pertaining to each stage of industrial diversification, are likely to be in a better position to assess the value of diversification. When firms diversify geographically, there are uncertainties associated with the value relevance of this diversification. However, unlike pure industrial diversification, a major portion of uncertainties associated with geographic diversification is due to the foreign exchange risk, and host country's political risk and regulatory risk (see Reeb et al., 2002). It is unlikely that corporate insiders possess any special advantage over outside investors in assessing the value implications of these economy-wide risks (see Demsetz, 1986). Consequently, the gap between insiders' and outsiders' information about geographic diversification ~~may be likely to be~~ smaller than that for industrial diversification.

### **3 – Data and Methodology**

We rely on multivariate regression analysis to examine the link between insider trading and corporate diversification. Our dependent variables are various measures of insider trading (discussed below), and our focus variables (Leamer, 1983; Woodward, 2006) are various measures of corporate diversifications. In a multivariate regression setup, for results on the relationship between insider trading and corporate diversification to exhibit inferential and measurement robustness (see Leamer 1986; Woodward, 2006), we (1) control for other variables that are likely to affect insider trading (e.g. firm size, firm-specific risk) and check whether including or excluding various control variables



affect our results, (2) use alternative ways to model insider trading (e.g. using fixed-effect panel data regressions, ordered probit model, fractional logit model, and zero-one inflated beta distribution), and (3) use alternative ways to measure insider trading and corporate diversification. If our key results regarding the link between our dependent variables (i.e. measures of insider trading) and our focus variables (i.e. measures of corporate diversification) fluctuate substantially, then our conclusions are likely to be fragile (Leamer, 1983).

Without controlling for other variables, we may have omitted variable bias, especially if these variables are correlated with corporate diversification (Wooldridge, 2008). However, it is important to note that there is no consensus on which variables should be controlled for in our regressions and how these variables should be measured. For example, in Fidrmuc et al. (2006), firm size appears as the value of market capitalisation in some specifications and natural log of the number of employees in other. However, in all the US studies, firm size is usually natural log of market capitalisation or total assets. Firm-specific risk appears in regressions in Coff and Lee (2003) but not in other papers. R&D expenditure is considered as a key variable in insider trading literature, but does not appear in Fidrmuc et al. (2006). No recent study on insider trading controls for executive directors' pay-performance sensitivity. Our strategy is to report results for the specifications including all variables for which data are available. We also try various combinations of these control variables. Our results about corporate diversification remain qualitatively same. These results are available from authors upon request.

### 3.1 – The measurement of corporate diversification and diversification discount

Although conceptually it may be reasonably straightforward to distinguish a focused firm from a diversified firm, the actual measurement of the extent corporate diversification is very difficult. To the best of our knowledge, almost all empirical studies that examine issues related to corporate diversification using a large sample of firms utilise segment level accounting data reported by public listed firms (see Sambharya, 2000; Martin and Sayrak, 2003). These studies use business count method, Herfindahl index, or the entropy index (see Jaquemin and Berry, 1979).

The alternative *strategic measure* of diversification ~~(,–~~which is very subjective and depends on the researchers' judgment) (see Martin and Sayrak, 2003, p.49), ~~is relatively less is somewhat less~~ –popular and used only when the sample size (firms and time periods) is relatively small. Comparing the validity of various measures of corporate diversification, Sambharya (2000: 1972) recommends “the entropy measure as the primary measure for researchers to consider due to its technical rigour, strong theoretical base, and lack of subjectivity and its relatively minor shortcomings”. ~~Another advantage of entropy measures is that it~~ also enables us to decompose diversification into related and unrelated diversification; other measures (e.g. Herfindhal index) do not offer such decomposition (see Jaquemin and Berry, 1979). Following Sambharya (2000) and a large number of empirical studies, our primary measure of corporate diversification is the entropy index. However, we do check the robustness of our results by using Herfindhal index as an alternative measure of diversification, with qualitatively similar results. ~~Our results are qualitatively similar.~~

The calculation of entropy is based on segmental data reported by public listed firms. Public firms in the UK follow the Statement of Standard Accounting Practice No. 25 (SSAP 25)<sup>7</sup> for segmental reporting. In the US, segmental reporting by public firms is based on the SFAS 131, which superseded the SFAS 14 in 1997<sup>8</sup> (see, e.g. Rajan et al., 2000; Jiraporn et al., 2008)<sup>9</sup>. According to the UK accounting standards, the purpose of segmental reporting is “to assist users of financial statement (a) to appreciate more thoroughly the results and financial positions of the entity...; and (b) to be aware of the impact that changes in significant components of a business may have on the business as a whole” (SSAP 25; p. 2). The aim of the segmental reporting standard followed by US firms is very similar (see SFAS 131, pp. 4-5).

The difficulty in measuring the extent of corporate diversification using reported segment data arises because the accounting standards, especially SSAP 25, provide corporate insiders (directors) substantial discretion in terms of how data pertaining to industrial and geographical segments are presented to outsiders. A reportable segment according to the SSAP 25 is one whose turnover, profit or net assets are 10% or more of the corresponding total values of its parent firm (SSAP 25: pp. 3-4). However, the standard is not very rigid regarding the identification of ‘classes of business’ and ‘geographic areas’ in which firms operate. Instead, the standard allows directors to use their own judgment to determine the classes of business and geographic regions ~~so in a way~~ that the reported data helps outsiders to assess the risk and development

<sup>7</sup> <http://www.frc.org.uk/asb/technical/standards/pub0389.html>

<sup>8</sup> <http://www.fasb.org/st/#fas150>

<sup>9</sup> We do not consider the implications of IFRS 8, which came into effect in 2009. Also, IAS 14 is rarely used by UK firms for segmental reporting (see Prather-Kinsey and Meek, 2004).

opportunities facing their firms. The standard also allows “non-disclosure of segment data if, in the opinion of the directors (managers), this is seriously prejudicial to the wellbeing of the enterprise” (Emmanuel and Garrod, 2002: 218).

The SFAS 131 in the US recommends the so-called *management approach* to segmental reporting that requires firms to provide information relating to operating segments that the top management uses for its decision making (see the SFAS 131, pp. 7-8). The identification of a reportable segment in the US differs from that in the UK. The SFAS 131 considers reportable segments (operating segments) as entities that parent firms earn revenue from or incur expenses on, and that are regularly reviewed by the management (pp. 21-22). US firms are required to report data for segments whose sales, profit or assets are 10% or more of the corresponding total values of their parent firm. Unlike the corresponding accounting standard in the UK, the SFAS 131 may provide more disaggregated data on segments. For example, US firms are required to provide data for segments operating in different countries given that sales in these countries are material (e.g. 10% of the total sales). However, if sales are not material, then firms can aggregate countries into regions. Consequently, the number of segments disclosed by firms may actually increase or decrease under the SFAS 131 (see Hope et al., 2009). A key feature of the segmental reporting standard in the US is that it requires firms to use mechanisms to identify reportable segments in a way that are “consistent with those used for internal evaluation (Harris, 1998: 112)”. The UK standard does not explicitly make this requirement. This distinction between the SFAS 131 and the SSAP 25 could make segmental reporting in the US more detailed and informative. However, to the best of our knowledge, there is no empirical work to substantiate this claim.

Although the reported segmental data enables researches to construct diversification measures for a large sample of firms, the measurement using this data may not accurately capture the extent of corporate diversification. For example, for reporting purposes, firms may ‘combine two or more activities that are vertically or otherwise related into a single segment’ or may ‘sometimes change the segments they report when there is no real underlying change in their operations’ (Martin and Sayrak, 2003: 47). In the UK, the SSAP 25 requires directors to review their reportable segments on an annual basis. A segment that only constitutes 9% of sales (or net assets) in a particular year may or may not be reported in that year. But, if the sales of this particular segment are 10% of total sales in the following year, directors are required to report it separately. However, it may be difficult to justify that because of a slight increase in sales of a particular segment relative to other segments, the firm has become more diversified. The problem of measuring diversification using segment data is further exacerbated when firms aggregate countries into regions. For example, some companies may bunch sales in Americas, while others may report North and South American sales separately<sup>10</sup>. This problem may be less severe in US firms following the SFAS 131 that requires material countries to be reported separately. However, according to the SSAP 25, segments can be reported for geographical regions that combine different countries. It is possible that some firms appear more diversified because of more detailed disclosure, while others are equally diversified but offer less detailed disclosure. We hope to capture this unobserved firm heterogeneity using firm-specific fixed effects in our regression analysis (see Rajan et al., 2001).

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<sup>10</sup> We thank an anonymous referee for this point.

The strategic approach to the measurement of corporate diversification may provide more refined, *albeit* very subjective, measures of corporate diversification by a thorough reading of annual reports and other disclosures by firms and by asking directors to provide more information (via questionnaires or interviews, for example) about the diversity of their firms' operations (e.g. Pehrsson, 2006). However, it is unlikely that detailed information will be ~~disclosed~~ disclosed, given that more disclosure regarding segments may lead to a gradual deterioration in the competitive advantages brought about by corporate diversification (Edwards and Smith, 1996; Hayes and Lundholm, 1996). Moreover, given that our sample period is from 1996-2006, it is virtually impossible to construct a measure of diversification based on a questionnaire. Consequently, like a large number of existing published studies, most recent being that by Hautz et al. (2011, this journal), we rely on segment level data to measure the extent of corporate diversification. However, by doing this, our study faces the same limitations that earlier studies face, and, hence, our results should be interpreted with caution.

We measure diversification using the entropy index calculated on the basis of segment-level sales data (see Clarke et al., 2004; Hautz et al., 2011). The industrial entropy index  $IND\_ENT_{it}$  for firm  $i$  in year  $t$  is calculated as follows:

$$IND\_ENT_{it} = \sum_{j=1}^n P_{jit} \ln(1/P_{jit})$$

where  $P_{jit}$  is the percentage of firm sales generated in industry segment  $j$  in year  $t$  (four-digit SIC code) and the summation is over the  $n$  industry segments in which the firm  $i$

operates at the beginning of year. The entropy index for geographical diversification is calculated using reported sales data for geographical segments. A larger value of the entropy index indicates a higher level of corporate diversification.

A key benefit of using the entropy index is that it enables us to distinguish between related and unrelated corporate diversification. This distinction is important because, as suggested by the theoretical and empirical literature (see Palich et al., 2000), the agency effect of diversification is likely to be stronger in the case of unrelated corporate diversification. Moreover, when firms diversify in unrelated areas, they are likely to reduce firm-specific risk through corporate diversification. This is important in the context of this paper because, as we argued earlier, insiders take on more firm-specific risk when they purchase shares of their own firms. Thus, it is important to examine whether the impact of unrelated diversification is any different from that of total diversification. We measure unrelated diversification by calculating the entropy measure of the degree to which a firm's sales are generated among unrelated segments using Fama-French 49 industry groups<sup>11</sup>. Specifically, the unrelated entropy index  $UN\_ENT_{it}$  for firm  $i$  in year  $t$  is calculated as follows:

$$UN\_ENT_{it} = \sum_{g=1}^k P_{git} \ln(1/P_{git})$$

where  $P_{git}$  is the percentage of firm sales generated by industry group  $g$  in year  $t$  (using Fama-French 49 industry groups) and the summation is over the  $k$  industry groups in which the firm  $i$  operates at the beginning of year (Clarke et al., 2004). We do not report

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<sup>11</sup> <http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/>

results for related diversification as related entropy is simply industrial entropy minus unrelated entropy.

<b>INSERT TABLE 1 ABOUT HERE</b>
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### **3.2 – The measurement of insider trading**

#### ***Insiders' willingness to purchase shares of their firms***

We model insiders' willingness to purchase in two ways. First, we measure the intensity of insider purchases for firm  $i$  in year  $t$  with purchase ratio ( $PR_{it}$ ), which is the number of shares purchased by insiders of a firm in a calendar year divided by total number of shares traded by insiders of that firm in that year (see Piotroski and Roulstone, 2005). Higher purchase ratio means that insiders buy more shares than they sell. This ratio measures corporate insiders' willingness to buy shares of their firms on the basis of their beliefs about the prospects of their firms and/or their perception about outsiders' misvaluation of their firms. Within the context of this paper, we expect purchase ratio to be high if insiders consider corporate diversification to be value enhancing and/or if they perceive that outsiders misvalue the diversification strategies in place.

The above analysis is useful in linking purchase ratio and corporate diversification. However, it is important to note that our dependent variable is a proportion that lies in the interval  $[0,1]$ , with a large number of our sample purchase ratios being either 1 or 0 as in Piotroski and Roulstone (2005). Consequently, to capture nonlinearities in the data and to avoid fitted values falling out of the closed interval in which the dependent variable lies (Ferrari and Cribari-Neto, 2004; Papke and Wooldridge, 2008), we utilise three alternative modelling strategies, namely, ordered probit model (Davidson and



Mackinnon, 2004), fractional logit model (Papke and Wooldridge, 2008), and zero-one inflated-beta distribution model<sup>12</sup>. Due to space constraint and to make our results comparable to existing studies, we only provide results for our linear model with panel data fixed-effects estimation and for ordered probit models. Our results regarding the link between the intensity of insider purchases and corporate diversification using the fractional logit and zero-one inflated beta distribution are in line with those presented in the paper. These results are available upon request.

For ordered probit model, we follow Piotroski and Roulstone (2005) and use the purchase ratio to construct an ordinal variable that takes on the value of 0 when purchase ratio is equal to 0 (i.e. insider only sell shares of their firms); 1 when purchase ratio is in the interval (0,0.5) (i.e. insiders sell more than they purchase); 2 when purchase ratio is in the interval [0.5,1) (i.e. insiders purchase more shares than they sell; and 3 when purchase ratio is equal to 1 (i.e. insiders only purchase shares of their firms). This ordinal variable attempts to measure “insider consensus” (see Piotroski and Roulstone, 2005) about corporate diversification strategies. That is, if insiders are very confident about their diversification strategies and believe that outsiders undervalue their strategies, then they are very likely to purchase more than they sell (so the ordinal variable is likely to be 2 or 3). However, if insiders are less optimistic about the value relevance of their strategies of their firms, then they are more likely to sell (so the ordinal variable is likely to be 0 or 1).

### ***Information conveyed by insider trading to outside investors***

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<sup>12</sup> We are very grateful to Maarten Buis for his detailed advice on the use of zero-one inflated beta distribution for proportions with multiple 0s and 1s. See: <http://www.maartenbuis.nl/presentations/berlin10.pdf>

We measure the information content of insider trading by estimating the abnormal returns around directors' daily net purchases and net sales using the standard event-study methodology based on the one-factor market model. The factor used is the return on the FTSE All Share Index. The estimation period for the parameters of the one-factor market model is 180 trading days ( $-200, -21$ ) relative to the notification date for directors' trades. Following the existing studies on the inside trading in the UK, we focus on a short event window around insider trading (e.g. Fidrmuc et al., 2006)<sup>13</sup>. Our main results are based on 3-days cumulative abnormal returns ( $CAR(-1,1)$ ) because as in earlier studies (e.g. Fidrmuc et al., 2006) we assume that the market responds to the information content of insiders' transactions immediately. However, it could be argued that market is slow to respond to the information contained in insiders' trades. Therefore, we check the robustness of our results using slightly longer event windows (4-days and 5-days).

### 3.3 – Other factors affecting insider trading

In our multivariate regressions, we control for firm size ( $SIZE_{t-1}$ ) measured by the natural log of total book value of assets at the beginning of year. Following the existing literature, we expect larger firms to have lower information asymmetries (see Jeng et al., 2001). We also expect firms with R&D expenditure to have higher information asymmetries than firms without R&D expenditure (see Coff and Lee, 2003). To distinguish between R&D and non-R&D firms, we use a dummy variable ( $R\&D_{t-1}$ ) that

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<sup>13</sup> Existing studies based on the US data such as Jeng et al. (2003) and Huddart and Ke (2007), however, measure the six-month cumulative abnormal return. Our choice of the announcement abnormal returns, similar to other studies based on the UK data such as Fidrmuc et al. (2006), reflects the speed of trade reporting, which is at most six days in the UK, compared to around 40 days in the US. Further, insiders in the US 'must disgorge profits attributable to offsetting purchases and sales that occur within six months of each other' (Huddart and Ke, 2007: 200) whereas insiders in the UK are not subject to this regulation. See Fidrmuc et al. (2006) for a comparison of the UK and US regulations on insider trading.

takes value 1 if the firm's R&D expenditure measured at the beginning of year is greater than zero and 0 otherwise. We also control firm leverage ( $LEV_{t-1}$ ) because higher leverage may result in better monitoring by debt holders, which, in turn, may reduce the level of information asymmetries (see Harris and Raviv, 1992).

Piotroski and Roulstone (2005) find that insider trading embodies both contrarian beliefs (i.e. trading against investor sentiment) and superior information about their future cash flow. Following Piotroski and Roulstone (2005), we use the book-to-market ratio ( $BM_t$ ) and the 12-month buy-and-hold market-adjusted return ( $RET_t$ ) at the end of fiscal year to control for the contrarian beliefs. We also include a dummy variable ( $GDROA_{t+1}$ ) that takes value 1 if the value of next year net income before extraordinary items scaled by total book value of assets is greater than the corresponding value for this year and 0 otherwise. This dummy variable attempts to control for insiders' superior knowledge about future performance.

We also control for firm-specific (idiosyncratic) risk in our regressions. The key rationale for controlling for firm-specific risk is that the informational advantage that insiders possess is related to factors that affect their own firms' prospects and not about factors that affect a large number of firms in the economy (see Demsetz, 1986). By buying their own firms' shares, corporate insiders bear higher firm-specific risk, given that their human capital is already invested in their firms. However, as Demsetz (1986) points out, this firm-specific risk is also a source of benefits from insider trading. Consequently, insiders purchase more only if their favourable information about their firms' prospects outweighs the cost of additional non-diversifiable risk. Controlling for

firm-specific risk is particularly important for our empirical analysis because the extent of corporate industrial (geographic) diversification is likely to be negatively (positively) related to firm-specific risk (Luabtkin and Chatterjee, 1994; Reeb et al., 1998). Thus, by not controlling for firm-specific risk, our regression analysis is likely to suffer from omitted variable bias (Wooldridge, 2008). We measure firm-specific risk ( $\text{Firm\_Risk}_{t-1}$ ) as the standard deviation of daily returns for 180 days prior to the first day of the year on which an insider trades (see Coff and Lee, 2003). For example, if the first insider trade for firm XYZ plc is on the 1<sup>st</sup> of June, 2000, then standard deviation is calculated using daily data for 180 days prior to this date<sup>14</sup>. For our regressions for the market reaction to insider trading, we also include *Multiple\_Purchase* (*Multiple\_Sales*) dummy variable that equal 1 when more than one director purchase (sell) shares on a particular day (see Fidrmuc et al., 2006). In our section on robustness checks, we also examine the link between corporate diversification and insider trading after controlling for executives' pay-performance sensitivity.

### 3.4 – Data description and sample characteristics

Our empirical analysis is based on directors' trading data obtained from Hemmington Scott and accounting and financial data from Datastream. Data on stock-based incentives (executive options and long-term incentive shares) are hand collected from annual reports. The original insider trading file from Hemmington Scott contains

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<sup>14</sup> In results not reported in the paper, we also used an alternative measure of firm-specific risk based on residuals from the market model (see Clarkson and Simunic, 1994). The market model was estimated daily returns for 180 days. For each firm year, the time period for the market model is 180 days before the first day of the year in which a corporate insider of that firm trades. For example, if the first insider trade of firm A is on the 1<sup>st</sup> of January 1999, then market model is estimated using daily returns data for 180 days leading to the 1<sup>st</sup> of January 1999. If the first insider trade of firm A is on the 1<sup>st</sup> of June 1999, then market model is estimated using daily returns data for 180 days leading to the 1<sup>st</sup> of June 1999. The factor used for the market model is the returns on FTSE All Share Index. The results are available [from the authors](#) upon request.

104,782 open market trades between January 1995 and March 2007. We delete 2,609 transactions where the trader is not a corporate insider (i.e. executive or non-executive director) and 1,656 transactions for which dates for insider transactions are not available. Following earlier studies we exclude insiders' sales after the exercise of options because these transactions are less likely to convey insiders' value relevant information to the market (Fidrmuc et al., 2006: 2942). We exclude 17,637 transactions for firms in financial services and 17,656 transactions for firms that could not be located in Datastream. We then delete 3,708 transactions before January 1996 and 20 transactions between January 2007 and March 2007. We exclude transactions for firms that do not have relevant accounting and financial data for the main regressions available in Datastream. We then aggregate the insider transactions at two levels. First, we aggregate trades annually to calculate purchase ratio for each firm year for all directors, for executive directors and for non-executive directors<sup>15</sup>. Second, we aggregate trades daily to calculate daily net purchases (and net sales) for all directors, for executive directors and for non-executive directors. The stock market reaction is calculated around these net purchases and net sales. At the annual level, our final sample contains 4,937 firm-years purchase ratios. At the daily level, our final sample contained 15,523 net daily purchases and 4,264 daily net sales. Our sample size is reduced for the regressions involving diversification discount due to data availability. Sample sizes for each director group (e.g. all directors, executive directors, and non-executive directors) are reported in the relevant tables.

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<sup>15</sup> We also conducted our analysis separately for transactions by CEOs. The results were qualitatively similar to those obtained for trades of executive directors. For brevity, we do not report results based only on CEO trades. [However, a copy of these results is available from the authors on request.](#)

Table 1 describes variables used in our empirical analysis. Panel A of Table 2 compares diversified (i.e. multi-segment) firm-years and focused (i.e. single-segment) firm-years on the basis of various firm-specific variables, while Panel B reports the correlation matrix for these variables. Multi-segment firms in our sample are significantly larger and spend significantly more on R&D than single-segment firms. Multi-segment firms also have significantly higher leverage than single-segment firms. This is consistent with the view that diversified firms have larger debt capacity due to the co-insurance effect (see Llewellyn, 1971).

Industrially diversified firms have lower firm-specific risk than single-segment firms. However, geographical diversification seems to increase firm-specific risk. This observation is consistent with the idea that firms take on more risk when they diversify internationally perhaps due to exchange rate risk, lack of information about foreign markets, political risk, and so forth (see Reeb et al., 1998). This observation once again highlights the importance of distinguishing between industrial and geographic diversification in the context of information asymmetries between outside investors and corporate insiders, where latter are expected to benefit more from the informational advantage when firm-specific risk is high. Multi-segment firms in our sample do not have higher 12-month buy-and-hold market-adjusted return or better future performance compared to single-segment firms. The mean industrial and geographical entropy measures of multiple-segment firm-years are 0.588 and 0.778, respectively. The mean unrelated entropy measure is 0.388, which is about 66% of the mean industrial entropy, suggesting a high level of unrelated diversification by firms in our sample.

<b>INSERT TABLE 2 ABOUT HERE</b>
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## 4 – Empirical Results

### 4.1 – Corporate diversification and insider trading – Univariate analysis

We report means of the purchase ratios, the number of trades by directors and the abnormal returns around directors' trades in Table 3. In each of the four panels we compare single-segment firm-years with low-diversification firm-years (i.e. firm-years for which entropy is below the sample median) and high-diversification firm-years (i.e. firm-years for which entropy is above the sample median). The entropy measures are for total industrial diversification, unrelated industrial diversification and geographical diversification. Purchase ratios, the number of trades and the abnormal returns are reported for directors, executive directors and non-executive directors.

<b>INSERT TABLE 3 ABOUT HERE</b>
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Panel A shows that mean purchase ratio for single-segment firms is significantly lower than that for diversified firms, whilst the. ~~Also, the~~ number of purchase (sale) transactions are significantly larger (smaller) for more diversified firms. Moreover, results in Panels C and D suggest a positive (negative) market reaction to directors' net purchases (sales) for all groups of firms. This is consistent with the existing literature ~~on~~ ~~insider trading~~ (e.g. Fidrmuc et al., 2006). However, no clear picture emerges regarding the relationship between the abnormal returns around insider trading and the extent of corporate diversification. ~~It is evident that the~~ CARs around insiders' net purchases are

significantly higher for single-segment firms compared to those for diversified firms. However, there is no clear difference in the CARs around net sales. In summary, our univariate for CARs provide some support for Hypothesis 3b. That is, the market reaction around insiders' net purchases is higher for single-segment firms compared to that for diversified firms.

Overall, our univariate results for purchase ratios provide evidence in favour of Hypothesis 1b (i.e. the intensity of insider purchases increases with corporate diversification), while our results for CARs provide some support for Hypothesis 3b. However, these univariate test should be interpreted with caution given that they do not enable us to examine the relationship between insider trading measures (purchases ratio and CARs) and corporate diversification by holding constant other firm-specific variables that may be related to insider trading. The multivariate analysis in the next section will address this issue.

#### **4.2 – Corporate diversification and the intensity of insider trading – Multivariate analysis**

Table 4 reports results from the fixed-effect panel data regressions and ~~for~~-ordered probit model for all directors. Our focus variables are the entropy measures of total industrial diversification, unrelated industrial diversification and geographical diversification. The coefficients of industrial (total and unrelated) entropy measures are positive and statistically significant. The p-values for related and unrelated entropy are 0.001 and 0.012, respectively, for fixed-effect regressions. The results are even more statistically significant for the-ordered probit regressions. All our control variables,



except firm size, have expected signs. The coefficients for firm size is positive in fixed-effect model but negative in ordered probit. However, it is important to note that size is statistically insignificant in both models, and does not change our results regarding the link between dependent and focus variables<sup>16</sup>. Overall, the effect of total and unrelated industrial diversification holds even after controlling for other variables. These results suggest that insiders purchase more than they sell when industrial diversification is high. This is consistent with our Hypothesis 1b.

Our results also suggest that there is no significant relationship between the intensity of insider purchases and geographic diversification. This indicates that the intensity of insider purchases, while associated with industrial diversification, is not related to geographic diversification. This is consistent with our discussion in section 2.4, which suggests that insiders' informational advantage is greater for industrial diversification than for geographic diversification.

<b>INSERT TABLE 4 ABOUT HERE</b>
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Some recent studies ~~on insider trading~~ propose the 'information hierarchy hypothesis'. ~~which that~~ suggests that executive directors, who are closer to their firms' operations than non-executive directors, may have more value-relevant information about the prospects of their firms (e.g. Seyhun, 1986; Fidrmuc et al., 2006). In Table 5 we examine whether the link between industrial diversification and purchase ratio holds for different categories of directors. The fixed-effect model suggests that the coefficients for the entropy measures of total and unrelated industrial diversification are statistically

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<sup>16</sup> We also tried a model that does not exclude firm size. Results regarding insider trading and corporate diversification are qualitatively same.

significant only for non-executive directors. It appears that the intensity of purchases of executive directors, who are closer to the operations of their firms than non-executive directors, does not increase with the level of corporate diversification. However, as noted earlier, given the nature of our dependent variable (i.e. a proportion bound in the interval  $[0,1]$ ), linear regression model may not be appropriate. Our results from ordered probit model suggests coefficient for both executive and non-executive directors are statistically significant. Our results from fractional logit model and zero-one inflated beta distribution, not reported in the paper<sup>17</sup>, also suggest that executive directors' intensity of purchases is positively related to the extent of corporate diversification.

~~Another interesting observation is that the coefficient for geographical diversification for non-executive directors.~~ If we are willing to accept 10% significance level, ~~then this the coefficient for geographical diversification for non-executive directors~~ result suggests that non-executive directors' intensity to purchase shares of their firms increases with the level of geographic diversification; there is no significant relationship between executive directors' purchases and geographic diversification. One possible explanation for this difference is that unlike executive directors, non-executive directors in the UK do not receive considerable exposure to their firms' equity via their compensation packages (see Conyon et al., 2011). Consequently, if non-executive directors consider geographic diversification strategies to be value-enhancing, they will purchase more of their firms' shares in the open market. Moreover, given the lack of economic integration among countries (Rodrik, 2000), geographic diversification may enable non-executive to further diversify their portfolios<sup>18</sup>.

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<sup>17</sup> A copy of results is available from the authors on request.

<sup>18</sup> We would like to thank an anonymous referee for this explanation.

INSERT TABLE 5 ABOUT HERE

#### 4.3 – Diversification discount and the intensity of insider trading – Multivariate analysis

~~This section examines the link between the intensity of insider purchases and diversification discount. We~~We calculate the diversification discount for our diversified firms using the method outlined in Berger and Ofek (1995). The excess value ( $EX\_VALUE_{it}$ ), a measure of discount, for firm  $i$  in year  $t$  is calculated as the natural log of the ratio of the firm's actual value to the sum of the imputed values of its segments. The imputed value of each segment is equal to the segment's sales multiplied by its industry median capital to sales ratio (see Berger and Ofek, 1995). The industry median capital to sales ratio for a segment operating in a particular industry is the median capital to sales ratio of all single-segment firms operating in that industry. ~~For example, for a segment operating in agriculture sector, median capital to sales ratio is the median of capital to sales ratio of single segment firms operating in that sector.~~We use Fama-French 49 industry groups for our analysis. Using the SIC codes of segments of diversified firms, we are able to identify standalone single-segment firms for segments of 2,281 firm-years. The mean excess value for this sample is -0.331. The negative excess value confirms the presence of diversification discount highlighted in Lins and Servaes (1999).

Table 6 reports results from the fixed-effect panel data regressions and ordered probit models. Our focus variable is  $EX\_VALUE_{it}$ . We find a negative and statistically

significant coefficient of the excess value for all directors suggesting that the intensity of insiders' purchases is increasing in the level of diversification discount. This finding is consistent with our hypothesis 2b and provides further support for the argument that insiders consider diversification strategies to be value enhancing, especially when outside investors undervalue these strategies. A very interesting finding is that the link between insider trading and diversification discount is primarily due to executive directors. Perhaps executive directors, who are closer to their firms' operations, are in a better position than non-executives, to know the true value ~~relevance~~ of diversification strategies, and, ~~hence thus, they~~ buy significantly more when outsiders' undervaluation is high. These results are consistent with the information hierarchy hypothesis.

<b>INSERT TABLE 6 ABOUT HERE</b>
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#### **4.4 – Corporate diversification and the market reaction to insider trading – Multivariate analysis**

In this section we employ multivariate regressions to examine the association between the market reaction around directors' transactions and the level of corporate diversification, taking into account several factors that are not controlled for in the univariate analysis. ~~It is important to note here that~~ insider purchases are expected to convey favourable information to outsiders, while insider sales are expected to convey unfavourable information. Thus, if a smaller firms (or firms with h R&D) have higher information asymmetries, then we expect positive (negative) information conveyed by insider purchases (sales) to be more positive (more negative) for smaller firm (for firms with R&D) (Coff and Lee 2003). ~~Coff and Lee (2003) find such opposite effect of R&D on the market reaction to insider purchases and sales.~~ Thus, when we examine the

relationship between firm characteristics such as R&D and firm size, we may obtain opposite signs for the market reaction to insider purchases and insider sales<sup>19</sup>. ~~It is also important to note that~~ The existing literature suggests that insiders' sales may be motivated by liquidity or diversification needs, and, thus, convey less information than insiders' purchases (see Jeng et al., 2001; Lakonishok and Lee, 2001; Coff and Lee, 2003; Fidrmuc et al., 2006). Thus, our primary focus is on the market reaction to insider purchases. However, we do provide all the corresponding results for insiders' sales for completeness.

Table 7 reports results from the ordinary least squares (OLS) regressions with the cumulative abnormal returns  $CAR(-1,1)$  around daily net purchases by all directors as the dependent variable in specifications (1) and (2),  $CAR(-1,1)$  around daily net purchases by executive directors in specifications (3) and (4), and  $CAR(-1,1)$  around daily net purchases by non-executive directors in specifications (5) and (6). In specifications (1) and (2), the coefficients for total entropy and unrelated entropy are positive and significant with p-values of 0.008 and 0.003, respectively. These results indicate that that the higher the level of industrial diversification, higher the market reaction to insider purchases. Our results for specifications 3-4 suggests that industrial diversification (total and unrelated) is also significantly positively related to the market reaction around executive directors' purchases. However, for non-executive directors, the market reaction to purchases is significantly related to unrelated industrial diversification only. Thus, our findings support hypothesis 3a. Moreover, there is some evidence that unrelated diversification creates higher information asymmetries.

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<sup>19</sup> A recent study multiplies reaction to sales by -1 to obtain same signs for firm-specific characteristics (see Betzer and Thiessen, 2009)

<b>INSERT TABLE 7 ABOUT HERE</b>
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As in our regression analysis for the intensity of insider purchases, we find that the impact of geographic diversification on CAR is different from that of industrial diversification. We find that the entropy measure of geographical diversification is significantly negatively related to the market reaction to directors' purchases. This again is consistent with idea that informational advantage provided to insiders by industrial diversification is greater than that by geographic diversification: ~~indeed, In fact,~~ our results suggest that geographical diversification reduces information asymmetry. It appears that the information diversification effect dominates ~~the any~~ -transparency effect for geographic diversification. Another potential explanation is that our measure of geographic diversification captures the quality of disclosure in the sense that firms that appear to be more diversified are those which provide more detailed information about their international operations. ~~Consequently, the market reaction is lower for these firms because these firms exhibit lower information asymmetries.~~

The coefficient of  $SIZE_{t-1}$  is negative and statistically significant, which is consistent with the notion that information asymmetries are higher for smaller firms (Seyhun, 1986; Fidrmuc et al., 2006; Huddart and Ke, 2007). The coefficients of R&D expenditure are statistically insignificant. The coefficients of  $Firm\_Risk_{t-1}$  for all specifications are positive and highly significant. This suggests that the market reaction is increasing in the level of firm-specific risk. It appears that the market takes into account how much firm-specific risk insiders are bearing when they buy shares of their own firms ~~(c.f. Demsetz 1986). This result is consistent with Demsetz's (1986)~~

~~suggestion that firms with higher firm specific risk offers greater opportunities to benefit from insider trading.~~

**INSERT TABLE 8 ABOUT HERE**

Table 8 presents results from the multivariate regressions with the cumulative abnormal returns  $CAR(-1,1)$  around insiders' sales as the dependent variable. The coefficients of all the entropy measures of industrial and geographical diversification are not statistically significant different from zero. This finding is consistent with the result of the univariate analysis reported in Panel C of Table 3. Following the existing literature, we argue that sales transactions are motivated by directors' liquidity needs rather than their informational advantage, and, therefore, the market reaction to these trades is not significantly related to firm-specific characteristics that determine the level of information asymmetries between insiders and outsiders.

#### **4.5 – The robustness checks**

##### *4.5.1 – Controlling for the impact of pay-performance sensitivity*

The insider trading literature has long argued that managers trade shares of their own firms to benefit from their informational advantage. An important argument in this literature is that insider trading can be considered as an alternative, and perhaps more appropriate, way of compensating managers (see Manne, 2005). Comparing the executive stock options and insider trading, Manne (2005) argues that the latter enables corporate insiders to “craft their own reward for innovations almost as soon as they occur and to trade without harm to any investors” (Manne, 2005: 7). If managers stock based compensation package is closely linked to their efforts, then their incentives for

using insider trading as a mechanism to reward themselves are likely to be lower. Consequently, we expect negative relationship between the managers' pay-performance sensitivity (defined below) and the intensity of insider purchases<sup>20</sup>. We re-run our main regressions for the intensity of insider purchases by specifically controlling for pay-performance sensitivity.

Controlling for pay-performance sensitivity is important because corporate diversification, the main focus of our study, is likely to be linked to benefits that managers derive from their firms. It is argued that corporate diversification increases the information-processing task that the management faces (Finkelstein and Hambrick, 1989) and places more demands on management, which, in turn, needs to be reflected in terms of reward systems (Henderson and Fredrickson, 1996). ~~Gomez-Mejia (1992) argues that management compensation should be designed to ensure that the extent of a firm's diversification really improves its performance. Moreover, corporate diversification provides benefits to insiders in terms of a reduction in risk associated with their human capital (Amihud and Lev, 1981).~~

The calculation for pay-performance sensitivity (*PPS*) follows Brick et al. (2011). Our measure of *PPS* includes executive share ownership, stock options, and long-term incentive shares. The measurement of *PPS* is very challenging for UK firms because the data on stock-based incentives, including stock options and long-term incentive plans, is not available in electronic format. Moreover, the way firms report/tabulate stock-based incentives in their annual reports is not similar, making data extraction extremely

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<sup>20</sup> We thank an anonymous referee for suggesting the use of *PPS* in our analysis.



difficult and time consuming (see Conyon et al., 2011). Thus, existing studies on *PPS* in UK firms use only a limited number of observations. Even recent studies focusing entirely on executive compensation are based on the compensation data on a limited number of UK firms. For example, Conyon et al. (2011) compares US and UK compensation using only two years of data for around 200 UK firms. Given this constraint, we hand collect data on stock-based incentives for all firms in our sample for 2004 to calculate *PPS*. After reading relevant sections of 433 annual reports, we are able to obtain complete information to calculate options deltas for 299 firms. The stock ownership data for these firms is obtained from HemmingtonScott. Delta for executive stock options is measured using Black-Scholes model, while delta for long-term incentive shares and existing ownership is taken as 1 (see Brick et al., 2011). The *PPS* measure for 2004 is used for regression analysis for insider trading for the period 2004-2006. Our earlier analysis without *PPS* is based on the period 1996-2006.

Our key results remain qualitatively unchanged even after controlling for the pay-performance sensitivity. Note that only the coefficient of the entropy measure of unrelated industrial diversification remains statistically significant in both specifications while the coefficient of the entropy measure of geographical diversification is significant in the specification for executive directors. This is not surprising given that our sample size is drastically reduced with very little variation in the independent variables because we have multiple trade events for firms with same independent variable in our regression models.

<b>INSERT TABLE 9 ABOUT HERE</b>
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#### 4.5.2 – Alternative measure of corporate diversification

As discussed in section 3.1, various measures of corporate diversification are utilised in the literature. Thomas (2002) uses Herfindhal index to examine the link between corporate diversification and information asymmetries. However, Thomas (2002) does mention that results remain unchanged with entropy. ~~Following the existing literature (see Sambharya, 2000),~~ Our preferred measure of diversification is entropy because it enables us to decompose diversification into related and unrelated diversification ~~(Sambharya 2000).~~ We check the robustness of our previously reported results using Herfindahl index calculated on the basis of industrial (geographical) segment level sales data (see Barnes and Hardie-Brown, 2006). The industrial Herfindahl index for firm  $i$  in year  $t$  is calculated as follows (see Thomas, 2002: 380):

$$IND\_HERF_{it} = \sum_{j=1}^n \left( \frac{S_{jit}}{\sum_{j=1}^n S_{jit}} \right)^2$$

where  $n$  is the number of reported industrial segments of firm  $i$  in year  $t$ .  $S_{jit}$  is total sales for industrial segment  $j$  of firm  $i$  in year  $t$ . The Herfindahl index for geographical diversification is calculated in a similar manner. The Herfindahl index ranges from 0 to 1, where 1 represents a focused firm. A smaller value of Herfindahl index indicates a higher level of corporate diversification. The results, which are reported in Table 8 using the purchase ratio in specification (1) and the  $CAR(-1,1)$  to insider purchases and sales in specifications (2) and (3), respectively, are consistent with the result reported in Tables 4, 6 and 7 using the entropy measures of diversification.

**INSERT TABLE 10 ABOUT**

#### 4.5.3 – Alternative measures of the purchase intensity and the market reaction

We use an alternative purchase ratio to measure the intensity of insider trading based on the value of shares purchased and traded by insiders ( $PR\_V$ ) ~~as in~~ (Rozeff and Rahman (1988)). The results, which are reported in Table 9, are consistent with our earlier result using the purchase ratio based on the number of shares purchased and traded. We also use the 4-day and 5-day cumulative abnormal returns (i.e.  $CAR(-1,2)$  and  $CAR(-1,3)$ ) around directors' transactions as alternative measures of the market reaction to insider trades. The results, which are reported in Table 10, are consistent with our earlier result using  $CAR(-1,1)$ <sup>21</sup>. It should be noted that while both total and unrelated industrial diversification are significantly related to  $CAR(-1,2)$ , only the latter is significantly related to  $CAR(-1,3)$ . This suggests that the market reaction is more significant nearer to the date of transactions.

INSERT TABLE 11 ABOUT HERE
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## 5 – Summary and conclusion

This paper provides evidence that distinguishes the agency effect of corporate diversification (i.e. managers diversify to benefit themselves) from the information effect of corporate diversification (i.e. diversification exacerbates information asymmetries making it difficult for investors to assess true value of their firms). Our findings suggest that the intensity of insider purchases is positively related to the extent of corporate diversification and to the level of diversification discount. This suggests that insiders consider diversification to be value increasing as they put their own wealth at stake by investing in their firms. ~~It could be argued that they diversify to increase~~

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<sup>21</sup> We also use  $CAR(0,1)$  and  $CAR(0,3)$  as the dependent variables. The key results remain the same and thus are not tabulated.

~~firm value rather than to extract private benefits, and that Hence,~~ they ~~seek~~try to signal their private information when they perceive that investors undervalue~~—the~~ diversification strategies~~—in place~~. We also find that that the information asymmetries measured by the market reaction to insider trading is positively related to the extent of corporate diversification. This suggests that outsider investors consider insider trading to be more informative for diversified firms. In practical terms, our results could mean that whilst diversification may well be for sound commercial reasons, rather than a product of the failure of shareholders to reign in their agents, diversification brings with it complexity and opacity, with outsiders finding it more difficult to accurately cost organisational capabilities. Given that there is considerable scepticism as to the benefits of diversification, this, in turn, may intensify pressures on managers to signal their confidence in their choices through share purchases. In practical, policy terms, this paper indicates the need for more nuanced understandings as to why firms diversify than simply owing to agency failure, and the need to develop more robust mechanisms for alleviating the information asymmetries that are the result of diversification.

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**The Association between  
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 Reporting Decisions**  
**MARY STANFORD HARRIS\***

Extending Modern Portfolio Theory into the Domain of Corporate Diversification: Does It Apply?

Michael Lubatkin and Sayan Chatterjee

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International Diversification and Analysts' Forecast Accuracy and Bias

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